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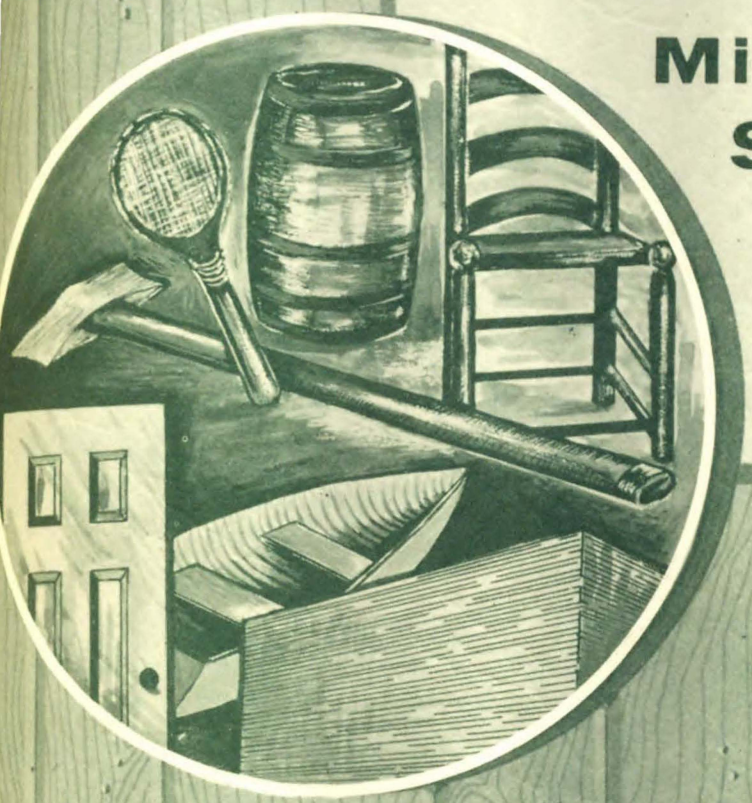
FOREST PRODUCTS MARKETING

WOOD USE by Manufacturing Firms in Minneapolis and St. Paul



by
John R. Warner
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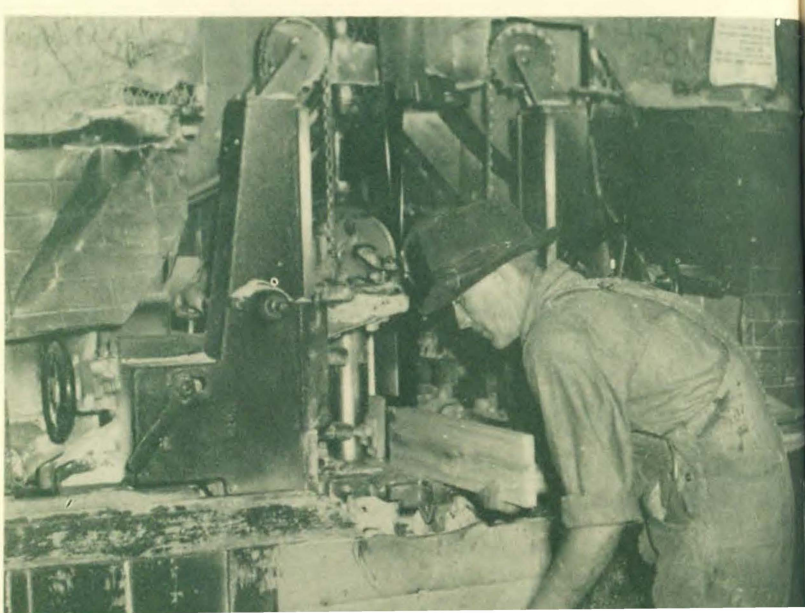
FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

Marketing begins when the trees are cut.

In the Lake States region, trees are often converted to lumber and other products by small mills such as this.



Native lumber is often used in factories where boxes are produced. The consumer of industrial lumber, in this case a box factory, determines what types and amounts of lumber will be purchased.

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Wood Use

by Manufacturing Firms in Minneapolis and St. Paul

by
John R. Warner and Carl H. Tubbs[1/]

Introduction

Farmer Brown cannot prosper by producing brown eggs when the housewife buying his eggs wants white ones. The farmer must, therefore, either find a way to make his chickens lay white eggs or find markets for his brown ones.

Forest products producers are faced with much the same problem. At present, Minnesota has large surpluses of hardwood timber. Although the total volume of timber has increased, much of the increase has been in presently low-valued species such as elm, aspen, ash, and paper birch. For example, in 1953 the Forest Survey estimated the annual allowable cut of aspen sawtimber at 144.2 million board feet, while the amount cut was only 44 million board feet.

Farmer Brown by knowing the facts of the egg market may be able to find purchasers who could use brown eggs as well as white ones. Perhaps he may find that his eggs must be graded or sent to market in different quantities, or that a market exists where he did not expect to find one. Forest managers, lumber operators, and firms purchasing lumber may all profit by the same type of information about lumber markets.

Recently the Division of Forestry of the Minnesota Department of Conservation, and the Lake States Forest Experiment Station cooperated in a study designed, first, to find the best means of collecting lumber consumption data, and second, to determine the volume and characteristics of the lumber used by manufacturing industries in Minneapolis and St. Paul.

1/ Research Foresters, Lake States Forest Experiment Station, Forest Service, U. S. Department of Agriculture. The Station is maintained in St. Paul 1, Minn., in cooperation with the University of Minnesota.

The Twin Cities manufacturing industries were chosen for the study since they are heavy, though discriminating, users of lumber in manufacture, shipping, and storage, and they provide a market for timber cut in this area. In a sense, these industries represent the last part of the market chain--yet a very important part since they decide what amounts and kinds of lumber will be purchased.

Work was conducted in two phases. The first, designed to find a suitable way of sampling, was done on a small scale during 1957. The survey was then expanded in 1958 to include all the manufacturing industries within the boundaries of Minneapolis and St. Paul. A description of the industry groups is given in the Appendix.

This paper reports the estimated lumber volumes purchased in 1957 by sources of purchase, uses of lumber, lumber grade and thickness, moisture content, degree of finish, and species. Also presented is a review of the study methods.

Procurement of Lumber

How much lumber[2/] is used? Who uses it? From whom does it come, and where are these sources located?

Half the Lumber Volume is Purchased Direct

Twin Cities manufacturing industries bought an estimated 60 million board feet of lumber in 1957 (table 1). Direct sales from sawmills account for half the lumber bought while middlemen supply the remaining half (fig. 1). Ninety-seven percent of the lumber purchased from sawmills is sent to firms using large (over 100,000 board feet) volumes of lumber. Purchases direct from producers are not unusual in industrial marketing since buyers are often able to order in large quantities. Firms using large volumes of wood also purchase much lumber from wholesalers but somewhat less than from sawmills.

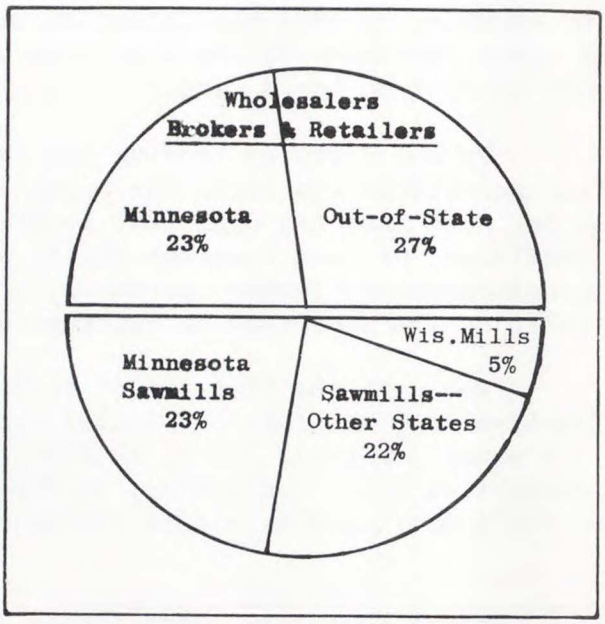

Figure 1.--Percent of lumber purchased, by source of supply; all firms, 1957.

2/ The term "lumber" includes blocking and dimension stock.

Table 1.--Volume of lumber purchased by Twin Cities manufacturers from various sources by annual purchase groups, Twin Cities - 1957

(Thousand board feet)

Lumber purchase source	Firms purchasing			Total volume
	From 1 to 10 M bd. ft.	From 11 to 100 M bd. ft.	Over 100 M bd. ft.	
Minnesota sawmills	119	553	13,137	13,809
Wisconsin sawmills	5	83	2,759	2,847
All other sawmills	11	25	13,292	13,328
Minnesota wholesalers	752	1,507	5,952	8,211
All other wholesalers	103	297	14,666	15,066
Twin Cities retailers	635	2,047	866	3,548
Minnesota brokers	0	123	1,879	2,002
All other brokers	0	0	1,100	1,100
Other sources	11	51	227	289
Total	1,636	4,686	53,878	60,200
Percent	2.7	7.8	89.5	100.0

On the other hand, Twin Cities manufacturers purchasing less lumber (under 100,000 board feet) deal primarily with wholesalers and retailers. Their orders are presumably in smaller quantities and can be handled more efficiently by these middlemen. Brokers are of minor importance.

Over Half the Lumber Used Comes from Outside the State

Concerns buying less than 100,000 board feet per year deal almost entirely with Minnesota suppliers, while those firms buying more than 100,000 board feet are supplied about equally from Minnesota and out-of-State sources (table 1 and fig. 2). Since firms purchasing more than 100,000 board feet account for 90 percent of the total lumber volume bought, over half of all lumber comes from outside the State.

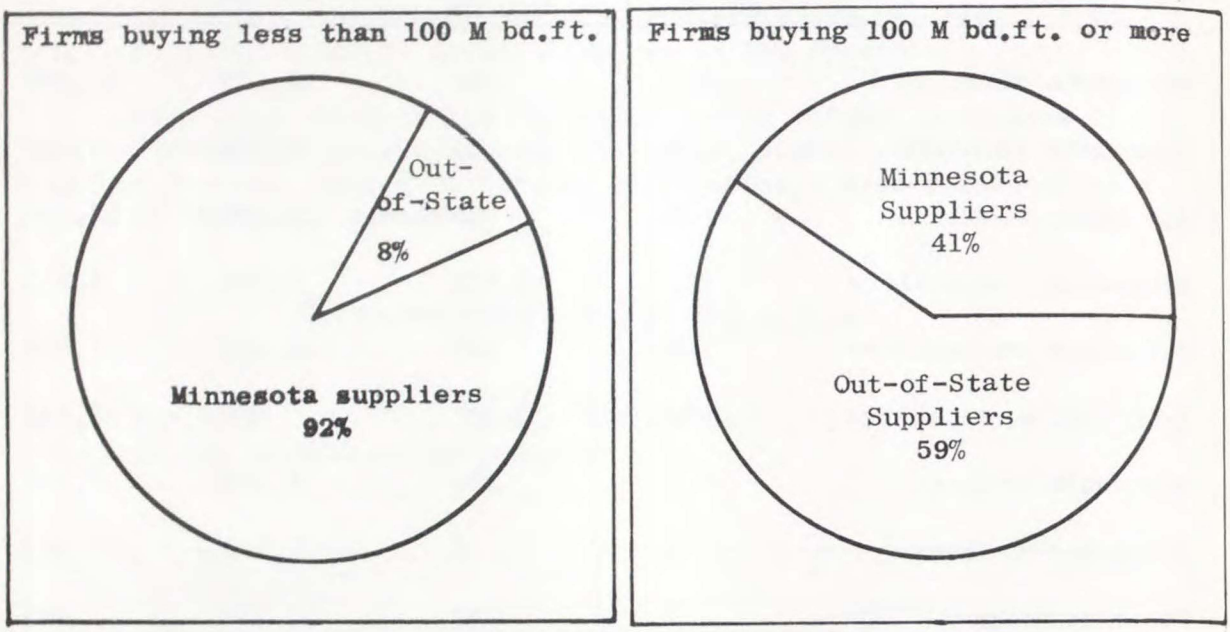
Firms buying less than 100 M bd.ft.
Out-of-State 8%
Minnesota suppliers 92%
Firms buying 100 M bd.ft. or more
Minnesota Suppliers 41%
Out-of-State Suppliers 59%

Figure 2.--Percent of lumber purchased by source of supply, 1957.

Lumber and Wood Products Manufacturers Purchase the Most Lumber

Twin Cities lumber purchases are concentrated within four manufacturing groups (table 2 and fig. 3). As might be expected, Lumber and Wood Products firms buy the most, followed by manufacturers of miscellaneous products.3/

3/ Includes such industries as sporting goods, pens and pencils, toys, and novelties.

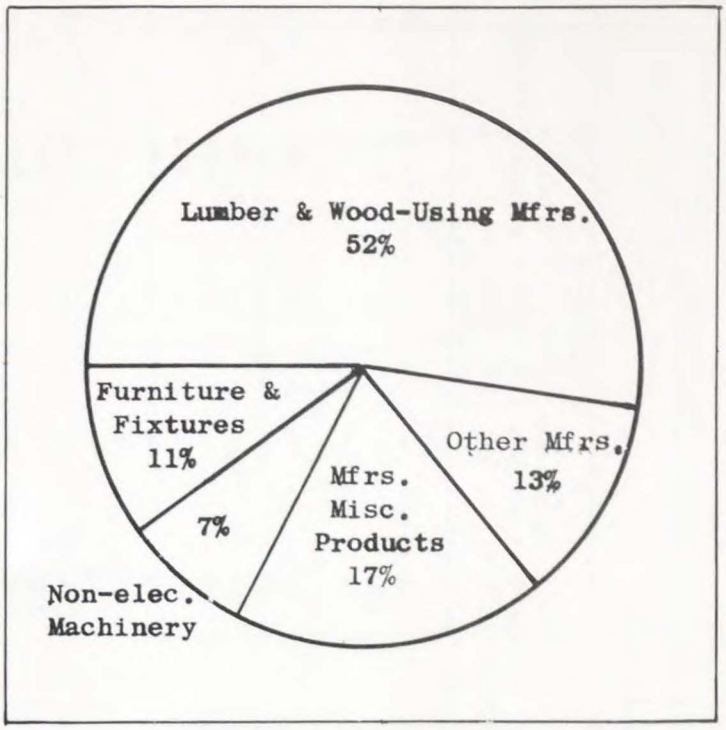

Figure 3.--Percent of lumber purchased, by manufacturing industry groups.

Lumber and Wood Products manufacturers depend mainly on out-of-State suppliers, ordering 68 percent of their lumber from sources outside Minnesota. Sawmills supply the largest volume for them.

Concerns under the heading of "miscellaneous" also receive much of their lumber from out-of-State suppliers (75 percent). Unlike the group above, however, this industry buys primarily from wholesalers.

Furniture and Fixture manufacturers, in contrast, purchase the bulk of their lumber from Minnesota sources (74 percent). Sawmills and wholesalers are of equal importance to these firms.

Companies manufacturing nonelectrical machinery deal almost entirely with Minnesota sources, of which the most important are wholesalers. Other groups, individually using small percentages of the total volume, also deal largely with Minnesota suppliers--mainly wholesalers and retailers.

Table 2.--Source of lumber purchases by manufacturing industry groups, Twin Cities, 1957

(Thousand board feet)

Manufacturing industry group	Minnesota sawmills	Out-of State sawmills	Minnesota wholesalers	Out-of-State wholesalers	Twin Cities retailers	Minnesota brokers	Out-of-State brokers and other sources	Total volume	Percent
Ordnance	-	-	-	-	4	-	-	4	*
Food and kindred products	-	21	131	-	139	7	-	298	0.5
Textile mill products	-	-	21	-	-	-	-	21	*
Apparel and related products	38	-	-	-	21	-	34	93	0.2
Lumber and wood products	8,266	12,372	1,232	7,764	40	345	1,100	31,119	51.7
Furniture and fixtures	1,704	1,716	2,648	106	64	733	-	6,971	11.6
Paper products	698	174	-	6	29	-	-	907	1.5
Printing and publishing	349	-	-	22	43	-	-	414	.7
Chemicals	85	-	-	-	5	-	-	90	.1
Petroleum products	-	-	-	51	-	-	-	51	.1
Rubber products	-	-	-	-	-	-	-	0	0
Leather products	-	-	54	-	-	-	-	54	.1
Stone, clay, and glass	511	-	135	-	185	-	-	831	1.4
Primary metals	43	-	16	-	186	-	-	245	.4
Fabricated metals	241	184	744	305	464	-	-	1,938	3.2
Nonelectrical machinery	854	-	1,453	659	425	786	5	4,182	7.0
Electrical machinery	245	-	357	-	913	-	-	1,515	2.5
Transportation equipment	-	340	-	81	289	131	17	858	1.4
Instruments (Prof. equip)	-	11	-	-	356	-	6	373	.6
Miscellaneous	775	1,357	1,420	6,072	385	-	227	10,236	17.0
Total	13,809	16,175	8,211	15,066	3,548	2,002	1,389	60,200	-
Percent	22.9	26.8	13.7	25.0	5.9	3.3	2.4	-	100.0

* Less than one-tenth of one percent.

Nine-tenths of the Lumber Goes to the Smaller Firms

The relatively small firms (those having less than 250 employees) are the largest purchasers of lumber for industrial use, both in terms of total volume and average volume used per firm (table 3 and fig. 4). Over 92 percent of lumber use is by these small firms.

The largest firms commonly subcontracted with the smaller, more specialized concerns to meet their wood fabrication needs. In general, little relationship is apparent between firm sizes and sources of supply.

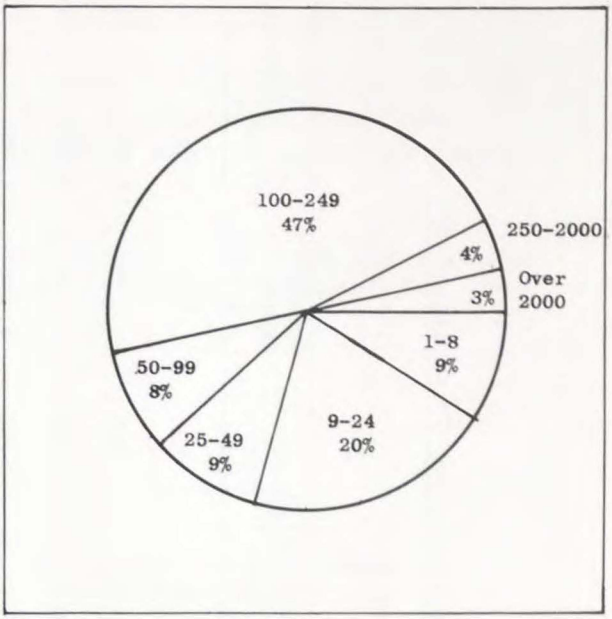

Figure 4.--Percent of lumber volume purchased, by size of firm. Size is indicated by number of employees.

How Industries Use Lumber

A knowledge of the uses of lumber should help forest operators to estimate what types of logs or lumber can be sold. Often small producers know little about the uses of the lumber they sell and thus fail to utilize raw material most efficiently.

Lumber uses are grouped into three general categories. Products manufacture includes such items as mill work, furniture, sporting goods, and caskets. Shipping lumber is used for crates, boxes, pallets, dunnage, etc. All other uses such as plant maintenance, shelving, storage, and remodeling are classed as "miscellaneous."

Table 3.--Source of lumber purchases by size of manufacturing firm, Twin Cities 1957

(Thousand board feet)

Firm size by number of employees	Minnesota sawmills	Out-of-State sawmills	Minnesota wholesalers	Out-of-State wholesalers	Twin Cities retailers	Minnesota brokers	Out-of-State brokers	Total volume	Percent
1 to 8	1,543	1,558	843	182	196	734	216	5,272	8.8
9 to 24	1,910	675	2,165	5,927	278	789	-	11,744	19.5
25 to 49	1,654	497	1,341	742	1,043	98	-	5,375	8.9
50 to 99	345	742	1,162	943	269	218	1,100	4,779	7.9
100 to 249	7,544	12,682	1,117	6,686	388	25	17	28,459	47.3
250 to 499	175	21	504	-	628	-	-	1,328	2.2
500 to 999	70	-	70	586	24	-	56	806	1.4
1,000 to 2,000	9	-	26	-	197	131	-	363	.6
Over 2,000	559	-	983	-	525	7	-	2,074	3.4
Total	13,809	16,175	8,211	15,066	3,548	2,002	1,389	60,200	-
Percent	22.9	26.8	13.7	25.0	5.9	3.3	2.4	-	100.0

Products Manufacture is the Primary Use of Lumber

The manufacture of products accounts for two-thirds of the lumber purchased (table 4 and fig. 5). Millwork utilizes the largest share of this volume (45 percent), most of which is imported softwoods.

Nearly all shipping lumber (93 percent) is used for crating and boxes. Hardwoods and softwoods are equally important for this use.

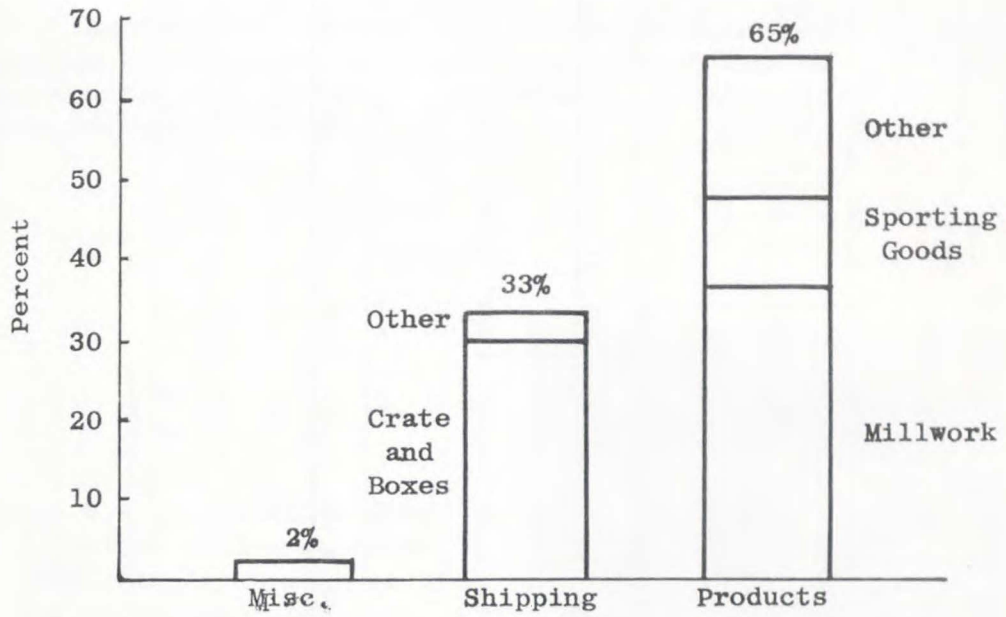

Figure 5.--Percent of lumber volume purchased, by industry use.

Miscellaneous uses are of minor importance, accounting for only 2 percent of the total.

Table 4.--Lumber used by Twin Cities manufacturing firms, by type of use and species, 1957

(Thousand board feet)

Lumber use	Hardwoods						Softwoods						Total volume	Percent
	Oak	Birch-maple	Aspen	Other hardwood 1/	Unknown and Misc.	Total hardwoods	Native softwoods 2/	Ponderosa pine	Douglas-fir	Other Western softwood	Unknown and misc.	Total softwoods		
Products														
Millwork	2,424	1,030	70	447	1,665	5,636	844	10,093	1,048	436	16	12,437	18,073	30.0
Furniture	49	904	122	119	-	1,194	4	764	-	143	-	911	2,105	3.5
Sporting goods	43	174	-	350	175	742	5	-	5,356	175	-	5,536	6,278	10.4
Cabinets	682	503	-	372	25	1,582	417	66	13	78	26	600	2,182	3.6
Industrial refrigeration	-	-	-	-	-	-	-	276	674	-	746	1,696	1,696	2.8
Caskets 3/	-	-	-	-	-	-	4	-	-	1,367	-	1,371	1,371	2.3
Framing	218	1,472	11	541	56	2,298	5	-	-	4	-	9	2,307	3.8
Other 4/	658	922	64	760	1,240	3,644	197	229	291	1,052	72	1,839	5,483	9.2
Product total	4,704	5,005	267	2,589	3,161	15,096	1,476	11,428	7,382	3,255	860	24,399	39,495	65.6
Shipping														
Crating and boxes	125	17	6,291	790	2,167	9,390	4,593	2,988	343	761	206	8,892	18,281	30.4
Pallets, skids, and dunnage	108	-	262	-	-	370	227	45	65	-	-	337	707	1.2
Blocking and dunnage	17	51	351	-	41	460	239	17	35	-	-	291	751	1.2
Shipping total	250	68	6,904	790	2,208	10,220	5,069	3,050	443	761	206	9,520	19,739	32.8
Miscellaneous 5/	103	23	-	10	85	221	17	377	173	145	32	744	966	1.6
All uses	4,427	5,096	7,171	3,389	5,454	25,537	6,552	14,855	7,998	4,159	1,098	34,663	60,200	-
Percent	7.3	8.5	11.9	5.7	9.0	42.4	10.9	24.7	13.3	6.9	1.8	57.6	-	100.0

1/ Includes ash, basswood, elm, tropical hardwoods.
2/ Mostly northern pine.
3/ Nearly all redwood.
4/ Includes patterns, industrial tables, toys, etc.
5/ Includes plant maintenance, shelving, storage, etc.

How are Species Used?

Generally, softwoods and hardwoods are of equal importance for shipping lumber (table 4). Although hardwoods (other than aspen) are primarily purchased for product manufacture, softwoods make up slightly more (61 percent) of the volume utilized for products.

Nearly all of the native softwood lumber purchased is used for crating and boxes (fig. 6). Ponderosa pine is mainly bought for Millwork products, although a large volume (nearly 3 million board feet) is used for crating and boxes. Douglas-fir is utilized mostly in sporting goods manufacture (ping-pong tables, boat carriers, etc.). Casket manufacture required nearly $1\frac{1}{2}$ million board feet of redwood.

Most of the oak goes into product manufacture. Millwork is the main use of this species. About the same amounts of birch and maple combined are used for Millwork products, framing, furniture, and miscellaneous products.

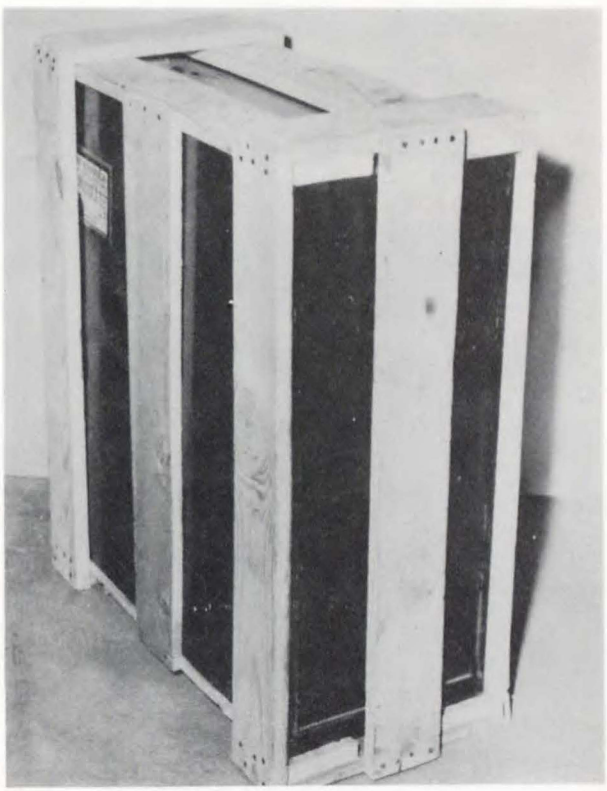

Figure 6.--Native white pine and other native softwood lumber is frequently used for shipping crates such as this.

Aspen is the only hardwood species used for shipping lumber in any sizable amount (fig. 7). Ninety-one percent, or about 6 million board feet, of the total aspen purchased is used for crating and boxes. Even though the aspen volume used in the Twin Cities seems large (about 7 million board feet, total), this market would have to expand nearly 13 times to utilize the aspen sawtimber which should be cut annually in Minnesota.[4/]

The volumes of species used by the four largest wood-using industry groups are shown in table 5.

Lumber and Wood Producing industries are heavy users of both softwoods and hardwoods, with ponderosa pine constituting about 40 percent of the total volume used by these firms. They also purchase about half of the total oak, aspen, and native softwoods volumes used. The principal purchases by the Furniture and Fixtures group are hardwoods, half of which are birch and maple. Nonelectrical Machinery firms buy mostly softwoods, principally native conifers. Softwoods also form the bulk of the lumber used by the Miscellaneous group, whose largest purchases are of Douglas-fir.

Most Firms Use Lumber for One Purpose

Twenty-seven different uses are made of lumber by firms in the various industry groups. However, 76 percent, or nearly 1,400 firms, purchase lumber for a single use.

Figure 7.--Aspen stands such as this provide lumber for boxes and crates. Many overmature aspen trees similar to the one in the center are not cut because of inadequate knowledge of markets.

4/ Cunningham, R. N.; Horn, A. G.; and Quinney, D. N. "Minnesota's Forest Resources," U. S. Forest Service Forest Resource Report No. 13, 52 pp., illus. 1958. (Tables 19 and 24.)

Table 5.--Species of lumber used, by selected manufacturing industry groups, Twin Cities, 1957

(Thousand board feet)

Manufacturing industries	Hardwoods						Softwoods					
	Oak	Birch-maple	Aspen	Other hardwood 1/	Unknown and misc.	Total hardwoods	Native softwoods	Ponderosa pine	Douglas-fir	Other Western softwood 2/	Unknown and misc.	Total softwoods
Lumber and wood products	2,685	1,154	4,420	1,218	4,948	14,425	2,835	11,954	724	1,181	-	16,694
Furniture and fixtures	730	2,599	782	960	139	5,210	638	772	161	148	42	1,761
Nonelectrical machinery	192	17	412	11	38	670	1,077	530	961	199	745	3,512
Miscellaneous	26	1,169	82	700	179	2,156	110	874	5,364	1,646	86	8,080
Other	794	156	1,475	500	150	3,076	1,892	725	788	985	225	4,616
Total volume	4,427	5,096	7,171	3,389	5,454	25,537	6,553	14,855	7,998	4,159	1,098	34,663
Percent	7.3	8.5	11.9	5.7	9.0	42.4	10.9	24.7	13.3	6.9	1.8	57.6

1/ Other hardwoods include ash, basswood, elm, and tropical hardwoods.
2/ Other Western softwood includes redwood, hemlock, spruce, etc.

Characteristics of Lumber Used

Moisture content, surface condition, grade, and species are important characteristics in marketing lumber. Lumber operators working without specific knowledge about the market requirements of these factors are largely confined to guesswork, which often results in inefficiency.

Finished, Kiln-Dried Lumber is Preferred

Finished lumber--most of which is kiln-dried (table 6 and fig. 8)--makes up slightly more than half of the volume. Rough lumber, on the other hand, is usually purchased air dried or green. Although most groups bought more dried than green rough lumber, the Lumber and Wood Products industries were an exception. More than half of their rough lumber purchases were of green lumber.

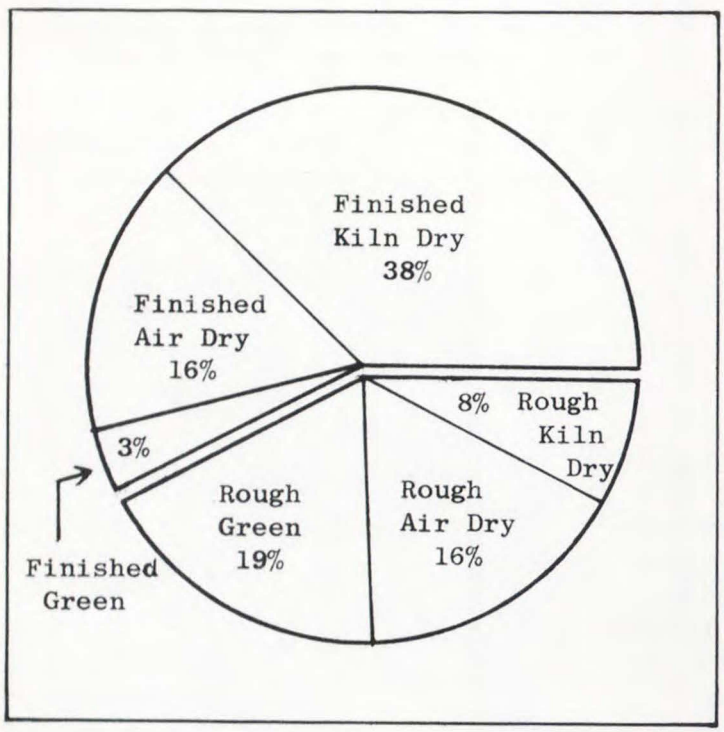

Figure 8.--Percent of lumber volume purchased by moisture content and surface condition.

Table 6.--Finished and rough lumber purchased by manufacturing industry groups, Twin Cities, 1957

(Thousand board feet)

Manufacturing industry group	Finished lumber				Rough lumber				Total 1/ volume
	Green	Air dry	Kiln dry	Total	Green	Air dry	Kiln dry	Total	
Ordnance	-	4	-	4	-	-	-	-	4
Food and kindred products	-	150	22	172	44	82	-	126	298
Textile mill products	-	-	-	-	-	-	21	21	21
Apparel and related products	-	60	33	93	-	-	-	-	93
Lumber and wood products	241	4,800	10,376	15,417	9,285	3,656	2,761	15,702	31,119
Furniture and fixtures	917	2,050	1,549	4,516	742	775	938	2,455	6,971
Paper products	43	131	35	209	218	480	-	698	907
Printing and publishing	-	-	64	64	-	175	175	350	414
Chemicals	-	5	-	5	85	-	-	85	90
Petroleum products	-	-	-	-	-	51	-	51	51
Rubber products	-	-	-	-	-	-	-	-	-
Leather products	-	-	54	54	-	-	-	-	54
Stone, clay, and glass	-	43	137	180	151	500	-	651	831
Primary metals	-	168	6	174	66	5	-	71	245
Fabricated metals	-	431	403	834	121	983	-	1,104	1,938
Nonelectrical machinery	-	573	2,220	2,793	57	791	541	1,389	4,182
Electrical machinery	-	432	745	1,177	-	338	-	338	1,515
Transportation equipment	-	457	203	660	5	192	1	198	858
Instruments (prof. equip.)	-	285	83	368	-	5	-	5	373
Miscellaneous	830	286	6,706	7,822	602	1,743	69	2,414	10,236
Total	2,031	9,875	22,636	34,542	11,376	9,776	4,506	25,658	60,200
Percent	3.4	16.4	37.6	57.4	18.9	16.2	7.5	42.6	100.0

1/ Includes dimension and blocking.

All Species are Purchased by Grade

Although all the volume is purchased by grade (fig. 9), two-thirds of the aspen is acquired as Millrun, a loose grade which excludes only cull lumber, (table 7).

Zasada reported in 1948[5/] that lack of grading had deprived aspen of some markets. Apparently grading of aspen (other than that to determine Millrun) is not much more prevalent in the industrial market today.

Although estimates are rough since some firms were uncertain of the grades they purchased, at least 65 percent of the lumber is purchased as No. 1 Common and Better.

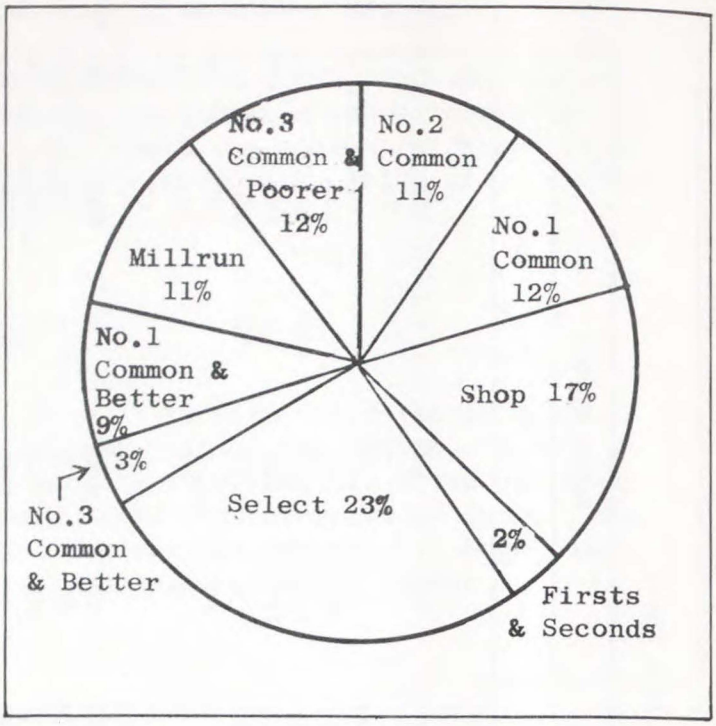

Figure 9.--Lumber volume purchased by grade, all species.

Among the hardwoods, aspen is mainly bought Millrun or as No. 3 Common, while other species are largely No. 1 Common or Better. The major share of hardwood select grades is made up of oak and birch.

The larger portion of western softwoods is composed of Shop and Select grades, while northern pine, in contrast, is fairly equally distributed between No. 3 Common, Millrun, and Select, with little volume in the intermediate grades.

5/ Z. A. Zasada. Aspen lumber grades and characteristics. U. S. Forest Serv., Lake States Forest Expt. Sta., Lake States Aspen Rpt. No. 6, 9 pp. 1948. (Processed).

Table 7.--Lumber grades purchased by manufacturing industries by species, Twin Cities, 1957

(Thousand board feet)

Species	Firsts and seconds	Select	Shop	No. 1 Common	No. 2 Common	No. 3 Common & poorer	Mill-run	No. 1 Common & better	No. 2 Common & better	No. 3 Common & better	Total volume
Oak	278	1,692	-	1,243	269	92	124	686	-	43	4,427
Aspen	2	-	-	98	692	1,440	4,803	-	-	136	7,171
Maple	245	181	-	228	480	51	-	-	11	-	1,196
Birch	170	1,075	-	1,329	826	271	14	207	-	8	3,900
Ash	175	236	-	55	-	-	78	-	-	-	544
Basswood	-	668	-	1,488	11	11	-	91	-	-	2,269
Elm	175	122	-	-	52	-	-	-	-	-	349
Tropical and misc. hardwoods	101	765	-	1,046	1,812	51	-	1,906	-	-	5,681
Total hardwoods	1,146	4,739	-	5,487	4,142	1,916	5,019	2,890	11	187	25,537
Northern pine	-	1,849	157	130	219	1,298	1,211	409	190	228	5,691
Other native softwoods	-	-	35	-	89	175	377	186	-	-	862
Western softwoods	-	7,396	10,145	1,628	2,181	3,493	5	1,470	305	389	27,012
Misc. and unknown softwoods	-	26	34	38	191	242	30	537	-	-	1,098
Total softwoods	-	9,271	10,371	1,796	2,680	5,208	1,623	2,602	495	617	34,663
All species	1,146	14,010	10,371	7,283	6,822	7,124	6,642	5,492	506	804	60,200
Percent	1.9	23.3	17.2	12.1	11.3	11.8	11.0	9.1	0.9	1.4	100.0

Most Lumber is 1
to 2 Inches Thick

Since many firms did not have easily accessible records of lumber thickness, it was necessary to record thickness by groups.

At least 72 percent of the volume falls in the smaller (1 to 2 inch) category (table 8 and fig. 10). Of the hardwoods, birch is the only species with more than half of its volume (57 percent) in categories which include the greater thickness. Oak and aspen also have substantial volumes in these categories, but are mainly purchased as 1- to 2-inch stock.

Although most Western softwood lumber is also in 1- to 2-inch thickness, nearly 30 percent (or about 8 million board feet) of its volume falls in categories which include the larger thickness.

Some 22 percent of the lumber is blocking and dimension stock; the greater share of this is purchased by the miscellaneous manufacturing group.

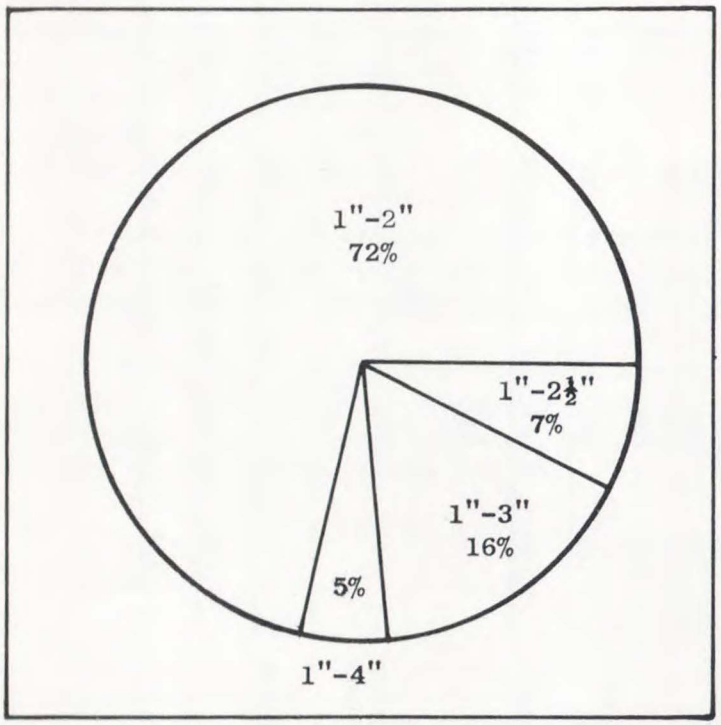

Figure 10.--Percent of lumber volume purchased by thickness.

Table 8.--Lumber thicknesses purchased by manufacturing industries, by species, Twin Cities, 1957

(Thousand board feet)

Species	1 to 2 inches	1 to 2½ inches	1 to 3 inches	1 to 4 inches	Other thickness	Total volume	Percent
Oak	2,903	372	1,048	87	17	4,427	7.3
Aspen	5,456	191	436	1,088	-	7,171	11.9
Maple	863	10	323	-	-	1,196	2.0
Birch	1,665	1,318	917	-	-	3,900	6.5
Ash	544	-	-	-	-	544	.9
Basswood	1,897	372	-	-	-	2,269	3.8
Elm	349	-	-	-	-	349	.6
Tropical and misc. hardwoods	5,057	222	398	-	4	5,681	9.4
Total hardwoods	18,734	2,485	3,122	1,175	21	25,537	42.4
Northern pine	4,118	807	677	89	-	5,691	9.5
Other native softwoods	862	-	-	-	-	862	1.4
Western softwoods	18,218	924	5,988	1,882	-	27,012	44.9
Misc. and unknown softwoods	1,098	-	-	-	-	1,098	1.8
Total softwoods	24,296	1,731	6,665	1,971	-	34,663	57.6
All species	43,030	4,216	9,787	3,146	21	60,200	-
Percent	71.6	7.0	16.3	5.1	*	-	100.0

* Less than one-tenth of one percent.

What Industry Thinks of Lumber

By gaining some insight into how industries regard lumber as a material for their purposes, lumber operators may find new outlets for species not previously used and adjust operations to meet the demands of lumber users.

Firms were asked if they thought lumber satisfactory for their needs--and, if they were using imported species exclusively, why they had not tried native species.

Fewer users of imported softwoods had tried native species than had firms buying imported hardwoods. Generally, users of imported lumber had not bought native species because they believed that the required grade or species characteristics were not available in native lumber. Also greater dependability of supply was important to the larger users. Price was of first importance mainly to users of small volumes (table 9).

Almost no one was dissatisfied with the lumber currently used, although some (28 percent) were neutral (table 10).

Table 9.--Reasons for nonuse of Minnesota-produced lumber by Twin Cities manufacturing industries, 1957[1/]

(In percent)

Reasons for nonuse	Rated importance	Firms purchasing: From 1 to 10M bd.ft.	From 11 to 100M bd.ft.	Over 100M bd.ft.
Required grade unavailable	First	27	30	32
	Second	-	18	9
Required species unavailable	First	27	25	30
	Second	8	-	11
Dependable supply unavailable	First	-	18	15
	Second	-	9	21
Lower price available	First	19	14	8
	Second	-	-	4
Other reasons[2/]	First	27	13	15
	Second	-	-	2

1/ Based on the following number of firms: 59 purchasing 0-10M bd.ft.; 44 purchasing 11-100M bd.ft.; and 47 purchasing 100M bd.ft. or more.

2/ Examples of reasons placed in this category are: (a) general office buys lumber for local fabricating plant, (b) never thought of using regionally grown species--would buy them if approached, and (c) buy from supplier stocking only West Coast lumber species.

Table 10.--Degree of satisfaction with lumber performance by manufacturing industry users, Twin Cities, 1957

Expression of lumber performance	Hardwoods		Softwoods		Total	
	Number of users	Percent	Number of users	Percent	Number of users	Percent
Firms using native species						
Satisfied	136	75.5	103	71.0	239	73.5
Neutral	43	24.0	42	29.0	85	26.1
Dissatisfied	1	.5	-	-	1	.4
Total	180	100.0	145	100.0	325	100.0
Firms using imported species						
Satisfied						
Tried native species	23	52.3	8	11.3	31	26.9
Had not tried native species	21	47.7	50	70.4	71	61.7
Total	44	72.0	1/ 71	65.7	115	68.0
Neutral						
Tried native species	10	58.8	3	17.0	13	24.0
Had not tried native species	7	41.2	18	49.0	25	46.2
Total	17	28.0	1/ 37	34.3	54	32.0
All users of imported species	61	100.0	108	100.0	169	100.0
All users	241	-	253	-	494	-
Percent	48.8	-	51.2	-	100	-

1/ Since a few of those expressing an opinion about imported species did not know if their firms had tried regionally grown species, the figures will not add to these totals.

Study Methods

Sampling methods used in this study were exploratory. Objectives were to design and test a sampling scheme that would produce good results at low cost. Both designs tested were based on the listing of the manufacturing industries operating in the Twin Cities of Minneapolis and St. Paul as shown by the Minnesota Directory of Manufacturers. This Directory is revised every 2 years and was accepted as a complete listing.

The 1957 Pretest

The key assumption in designing the sample for the pretest was that as the size of manufacturing firms increased, lumber volume used also increased. Consequently, within each of the seven manufacturing industry groups first studied, sampling strata were set up on the basis of firm size. The intensity of sample was 35 percent of the total population (887 firms in the 7 manufacturing industry groups).

Analysis of the grouped pretest data showed that the correlation of size of firm and volume of lumber use was not high enough to use firm size as strata in the sample design. The resulting disadvantage was partially offset by heavier sampling so that the standard error of estimate over the seven industry groups canvassed was less than 14 percent.

The 1958 Survey

Improved sampling accuracy in the second survey (standard error equalled 1.5 percent) was achieved by arranging firms for each of the 20 manufacturing industry groups into four strata based on the volume of lumber each purchased during 1957. This was done by a telephone service which called each firm and rated it accordingly.

The sampling intensity needed for industry groups within a stratum was then computed.[6/]

6/ $n = \frac{NC^2}{Ne^2 + C^2}$ where n = number of samples needed, N = the total number of wood-using firms in each stratum, and C and e are the coefficient of variation and the standard error respectively of the data stratified on a volume-used basis.

Firms to be sampled within strata 1-10 MBF and 11-100 MBF were then selected randomly, while all those concerns using over 100 MBF were included in the interviewing.

The telephone survey was subject to some error. Callers were not monitored and there may have been some deviation from the simple progressive conversational approach they were instructed to use. Combine this with the momentary reflection given the question of lumber purchases by the many and varied telephone respondents, and it is easy to see why this method gave less than perfect stratification, as shown in table 11.

Table 11.--Accuracy of industry assignment to volume strata by phone contact[1/]

Classification based on 1957 wood use	Number of firms	Percent of firms actually - Within stratum	Below stratum	Above stratum
0 board feet	1,228	-	-	-
1-10 M bd. ft.	405	40.5	44.6	14.9
11-100 M bd. ft.	136	56.3	35.9	7.8
Over 100 M bd. ft.	78	60.3	39.7	-
Total	1,847	-	-	-

1/ Percentages in this table are based on samples drawn from each stratum. No check samples were drawn from the "no use" stratum.

Comparison of 1957 Pretest and 1958 Survey Accuracies

Comparison of sampling intensity and precision of estimate between the two surveys shows clearly the superiority of the approach used for 1958.

	1957 pretest of 7 groups	1958 survey of all groups
Total number of firms	887	1,847
Number of firms in sample	338	216
Intensity of sample (percent)[1/]	38	12
Standard error (percent)	13.9	1.5

1/ The firms in the "over 100 M bd. ft." stratum are included. Since all of these firms were contacted they are not strictly a "sample." They totaled 45 firms in the pretest and 78 in the 1958 survey.

Study results are those developed from the 1958 survey. Those who use these results should be aware that figures in individual cells are not exact. They are estimates and contain some error, but their accuracy, though not computable, is reasonably high because of the large proportion of total volume found in the stratum of largest users.

Summary

1. Over 60 million board feet of lumber was purchased by Twin Cities industrial manufacturers in 1957.

2. About half of this volume is purchased directly from sawmills.

3. Half the lumber comes from out-of-State suppliers. These suppliers are important mainly to the largest lumber users; users of small volumes usually purchase lumber from local sources.

4. Products manufacture is the primary use of lumber (66 percent), and much of the lumber in this category is used for millwork.

5. Native softwoods and aspen which probably make up most of the native species used constitute only 23 percent of the volume and are used mainly for shipping materials.

6. Ponderosa pine is the major softwood species, accounting for 25 percent of the total volume purchased. Among the hardwoods, aspen leads with 12 percent of the total volume.

7. Manufacturers usually prefer finished lumber which has been kiln-dried. Lumber in this condition constitutes 38 percent of the volume.

8. All of the lumber is purchased by grade. However, about two-thirds of the aspen lumber is acquired as Millrun.

9. Three-fourths of the lumber is purchased in thicknesses ranging from 1 to 2 inches.

10. Essentially, all users are satisfied with the lumber they presently use. Firms using imported species exclusively, were asked why they had not tried native lumber. Most replied that they believed that the required species characteristics or grades were not available in native species or that supply was undependable.

Conclusion

Continued study of that part of the market structure involving local suppliers and lumber producers will be necessary to fully assess the reasons why more native lumber is not used in this market. The large number of industrial purchasers not using native species because lumber grades or other characteristics are seemingly not available is significant. However, the reasons why local producers have not conformed to market requirements have never been systematically investigated.

Also, lumber consumption in the Twin Cities area is on a far larger scale than is apparent from this study. Before a complete analysis of the market possibilities and deficiencies can be made, an investigation should be made of lumber consumed in construction, for example, as well as that used in industrial activity outside the boundaries of the Twin Cities.

The approach used in the 1958 survey worked well. The number of firms sampled decreased from 38 percent in the 1957 pretest (error of estimate 13.9 percent) to 12 percent of the firms in the 1958 survey (error of estimate 1.5 percent). Stratification of firms by volume of lumber used instead of the pretest method of stratification by firm size was responsible for the added accuracy and efficiency.

On similar studies in the future, a telephone survey will be the most desirable method of preliminary firm stratification and estimation of population although, as pointed out in the text of the report, an improvement should be made in telephone survey accuracy by providing some means of checking the calls.

Appendix

Manufacturing Industry Groups, the Study Units

The Standard Industrial Classification Manual, 1957, classifies the entire field of economic activities into 10 divisions. It gives a detailed presentation of the entire system, and carefully defines the component parts of each division. The reader wanting more information is referred to this Manual compiled by the Technical Committee on Industrial Classification, Office of Statistical Standards, and available through the Superintendent of Documents, Washington 25, D.C.

This Standard Industrial Classification, used by the U. S. Bureau of the Budget, defines the manufacturing division as "those establishments engaged in mechanical or chemical transformation of inorganic or organic substances into new products, and usually described as plants, factories, or mills, which characteristically use power-driven machines and materials-handling equipment. Establishments engaged in assembling component parts of the manufactured products are also considered manufacturing if the new product is neither a structure nor other fixed improvement."

The manufacturing division is composed of 20 manufacturing industry groups. Because these groups provided the hub for orientation of this study, they are listed and briefly defined below.

Major Group Number	Group Title and Definition
19	Ordnance and Accessories.--Includes firms "manufacturing artillery, small arms, and related equipment; ammunition; tanks...; and miscellaneous ordnance and accessories..."
20	Food and Kindred Products.--Includes firms "manufacturing foods and beverages for human consumption, and certain related products..."
21	Tobacco Manufacturers.--Not defined here because no firms were found in Minneapolis or St. Paul.
22	Textile Mill Products.--Includes firms preparing, treating, or manufacturing such articles as carpets, twine, thread, knit apparel, etc.
23	Apparel and Other Finished Products Made from Fabrics and Similar Materials.--Includes firms "producing clothing and fabricated products by cutting and sewing purchased woven or knit textile fabrics and related materials such as leather, rubberized fabrics, plastics, and furs."

Major Group Number	Group Title and Definition
24	Lumber and Wood Products, Except Furniture.--Includes firms "engaged in producing lumber and wood basic materials; and establishments engaged in manufacturing finished articles made entirely or mainly of wood or wood substitutes."
25	Furniture and Fixtures.--Includes firms "manufacturing...furniture; and office and store fixtures."
26	Paper and Allied Products.--Includes firms manufacturing "pulps...paper and paperboard; and the manufacture of paper and paperboard into converted products..."
27	Printing, Publishing, and Allied Industries.--Includes firms "printing by one or more of the common processes...establishments which perform services for the printing trade. This major group also includes newspapers, books, and periodicals, regardless of whether or not they do their own printing."
28	Chemicals and Allied Products.--Includes firms "producing basic chemicals, and establishments manufacturing products by predominantly chemical processes."
29	Petroleum Refining and Related Industries.--Includes firms "primarily engaged in petroleum refining, manufacturing paving and roofing materials, and compounding lubricating oils and greases from purchased materials."
30	Rubber and Miscellaneous Plastic Products.--Includes firms "manufacturing from rubber, gutta-percha, balata, or gutta-siak, rubber products such as tires, footwear..."
31	Leather and Leather Products.--Includes firms "processing leather and/or manufacturing...leather and artificial leather products..."

Major Group Number	Group Title and Definition
32	Stone, Clay, and Glass Products.--Includes firms manufacturing glass and such products as cement, pottery, concrete, and gypsum products."
33	Primary Metal Industries.--Includes firms "engaged in processing metals from ore and scrap; and in the manufacture of basic metal products; and in the manufacture of nails, spikes, etc."
34	Fabricated Metal Products, Except Ordnance, Machinery, and Transportation Equipment.--Includes firms "fabricating ferrous and nonferrous metal products..."
35	Machinery, Except Electrical.--Includes firms "manufacturing machinery and equipment, other than electrical equipment (Major Group 36) and transportation equipment (Major Group 37)."
36	Electrical Machinery, Equipment and Supplies.--Includes firms "manufacturing machinery, apparatus, and supplies for...utilization of electrical energy The manufacture of household appliances is included..."
37	Transportation Equipment.--Includes firms "manufacturing equipment for transportation of passengers and cargo by land, air, and water."
38	Professional, Scientific, and Controlling Instruments; Photographic and Optical Goods; Watches and Clocks.--Self-explanatory.
39	Miscellaneous Manufacturing Industries.--Includes firms "primarily engaged in manufacturing products not classified in any other manufacturing major group. Industries in this group fall into the following categories: jewelry, silverware and plated ware; musical instruments; toys; sporting and athletic goods; pens, pencils, and other office and artists materials; buttons, costume novelties, miscellaneous notions; brooms and brushes; morticians' goods; and other miscellaneous manufacturing industries."

INTERVIEW GUIDE FOR STUDY OF TWIN CITIES INDUSTRY
PURCHASES OF LUMBER, DIMENSION, AND BLOCKING FOR THE YEAR 1957

Firm No. _____ Industry group No. _____ Firm size _____ Date of interview _____
Firm name _____ Interviewee _____ Title _____
Firm address _____ Interviewer _____

1. Uses of lumber by species: (All future references to lumber only include dimension and blocking.)

Use category	Percent of total use	Species	Percent of use category	Performance + 0 -	Tried local species? Yes	No
a.		1.				
		2.				
		3.				
		4.				
b.		1.				
		2.				
		3.				
		4.				

2. When local species were not tried or used, was: (Rate reason numerically by order of importance.)
   a. Required grade not available _____
   b. Required species not available _____
   c. Dependable supply not available _____
   d. Lower price available _____
   e. Other (explain and rate) _____

3. From whom was lumber purchased:

Source	Percentage	Source	Percentage
a. Minnesota sawmill		f. Twin Cities area retailer	
b. Wisconsin sawmill		g. Minnesota broker	
c. Other out-of-state sawmill		h. Out-of-state broker	
d. Minnesota wholesaler		i. Other (specify)	
e. Out-of-state wholesaler			

4. Form and moisture condition of lumber purchases:

Form	% of Total	Moisture condition: Green	Air dry	Kiln dry	
a. Finished lumber					= 100% of finished lumber
b. Rough lumber					= 100% of rough lumber
Total	100%				

5. a. Volume of lumber purchased during 1957 _____ M board-feet
   b. Volume of dimension purchased during 1957 _____ "
   c. Volume of blocking purchased during 1957 _____ "

6. 1957 lumber purchases by species, grade, volume, and thickness.
   In the appropriate block for species and grade, enter volume and thickness. (See example below)
   V--For volume at top of square. T--For thickness at bottom of square.

Grades	Hardwood species: Oak	Ash	Basswood	Elm	Aspen	Hard maple	Soft maple	Birch	Tropical hardwoods	Unknown and misc. hdwds.
FAS	V:									
	T:									
Select	V:									
	T:									
#1 Com.	V:									
	T:									
#2 Com.	V:									
	T:									
#3 Com. & poorer	V:									
	T:									
Mill Run	V:									
	T:									
Unknown	V:									
	T:									

Grades	Softwood species: Northern pine	Other native softwoods	Southern pine	Western conifers	Misc. sftwds.	Unknown or
Select	V:					
	T:					
Shop	V:					
	T:					
#1 Com.	V:					
	T:					
#2 Com.	V:					
	T:					
#3 Com. & poorer	V:					
	T:					
Mill Run	V:					
	T:					
Unknown	V:					
	T:					

Example: 13 Volume in M board-feet.
4, 6, 8: Thickness by 1/2" classes, 4/4, 6/4, 8/4, etc.

7. Is wood waste used _____ (in plant), _____ (by employees), _____ (sold), _____ (burned), or _____ (other) (Check most important. If other category is used, specify use.)

8. Remarks or comments:

INSTRUCTIONS

Do not fill in blanks for Firm No., Industry group No., and Firm size. These will be filled in when all schedules have been completed and sorted.

1. Enter up to two uses of lumber made by the firm. Use another form if additional space is needed. Use category should be specific for products requiring a steady supply of lumber. More general use categories, such as "plant maintenance," may be used when specific designations are not logical. Percent of total use is the estimated percentage of the total lumber volume required for each use category. Species are those used within each use category. Percent of use category is the estimated volume percentage of each species used within each use category. Performance of each species within a use category is rated (+) for satisfactory and (-) for unsatisfactory. Tried local species to be checked yes or no when out-of-region species are listed.

2. Most reasons given will fall into categories a through d. For those that do not, use e and the open space on the right if more room is necessary. Number reasons consecutively beginning with 1 as the most important.

3. Enter percent purchased from each source. If "other" category is used because none of the listed sources apply, be sure to name this source and if necessary clarify it with a brief description.

4. Under "form" enter percentages of both finished and rough lumber to total 100 percent. Under "moisture condition" enter percentages of green, air dry, and kiln dry lumber to total 100 percent for both the finished and rough lumber categories.

5. Press the respondent for his best estimate of purchases in M board-feet during 1957 (January 1 through December 31) of lumber, dimension, and blocking.

6. For each species or species group, record book values or best estimates of volume purchased by grade and thickness of lumber. Enter values for volume and thickness in the intersection block of the species column and the grade row. Record volume in M board-feet in the top half of the square and thickness below. Enter thickness by 1/2" classes using only the upper half of the fraction of 2/4, 4/4, 6/4, 8/4, etc. (see example under question 6). When just one species of softwood is recorded and the name of this species is given, write in its name beneath its group category.

7. Check the one in this series which is most important. If "other" category is used, specify what this use was.

8. Record comments which in your opinion would be of interest or importance in developing improved markets for local and regional lumber. This section may also be used for elaborating on questions above. If additional space is required use a blank sheet, identify it appropriately and attach it to the schedule.

SOME RECENT STATION PAPERS
Lake States Forest Experiment Station

Marking Guides for Northern Hardwoods Under the Selection System, by Carl Arbogast, Jr. Sta. Paper 56, 20 pp., illus. 1957.

Managing Red Pine for Poles in Lower Michigan, by Paul C. Guilkey. Sta. Paper 57, 21 pp., illus. 1958.

Proceedings, Third Lake States Forest Tree Improvement Conference, Sept. 17, 18, 1957. Sta. Paper 58, 87 pp., illus. 1958.

Incidence of White Pine Blister Rust Infection in the Lake States, by D. B. King. Sta. Paper 64, 12 pp., illus. 1958.

Fire Fuels in Red Pine Plantations, by Loyd LaMois, Sta. Paper 68, 19 pp., illus. 1958.

Snow Behavior in Forests of Northern Minnesota and its Management Implications, by Sidney Weitzman and Roger Bay. Sta. Paper 69, 18 pp., illus. 1959.

The Forest Insect and Disease Situation, Lake States, 1958, by Gerald W. Anderson and Donald C. Schmiege. Sta. Paper 70, 18 pp., illus. 1959.

Growth of Swamp Conifers Following an Improvement Cut, by D. D. Skilling. Sta. Paper 71, 10 pp., illus. 1959.

Direct Seeding and Planting of Balsam Fir in Northern Wisconsin, by J. H. Stoeckeler and D. D. Skilling. Sta. Paper 72, 22 pp., illus. 1959.

Seed Production Areas in the Lake States: Guidelines for Their Establishment and Management, by Paul O. Rudolf. Sta. Paper 73, 16 pp., illus. 1959.

Forest Tree Improvement Research in the Lake States; A Survey by the Lake States Forest Tree Improvement Committee, by Paul O. Rudolf. Sta. Paper 74, 56 pp. 1959.